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HORN BUTTON CONSTRUCTION

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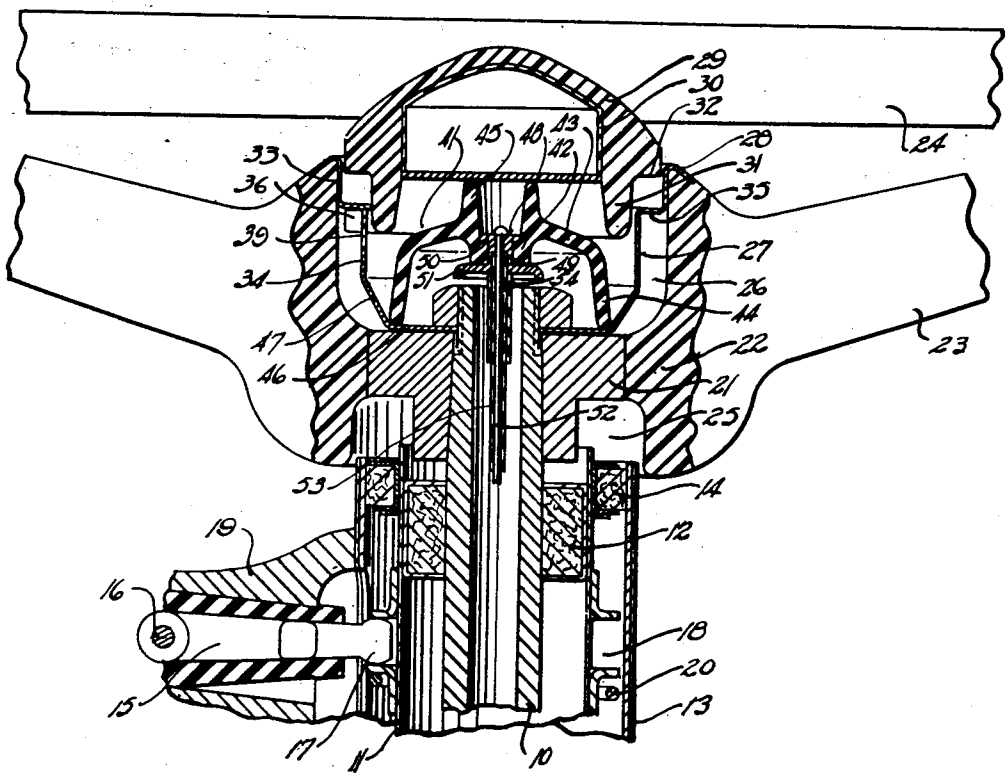


Fig. 1

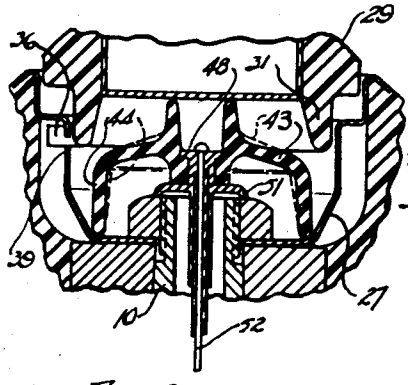


Fig. 2

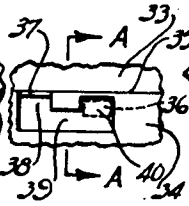


Fig. 4

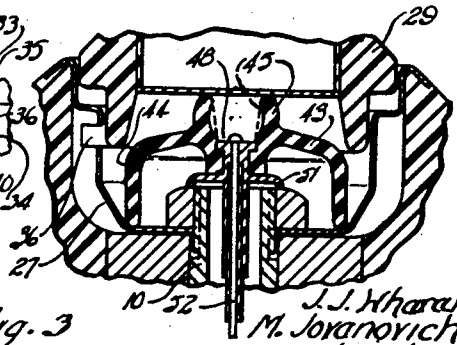


Fig. 3

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HORN BUTTON CONSTRUCTION

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3 Claims. (Cl. 200—59)

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This invention relates to push-button switches; and, more particularly, to electrical switches of the general type as used in motor vehicles to energize the horn circuit as well as to a resilient actuating member which may be used in push-button switches generally.

The invention is here shown as applied to a specific horn button construction, but it will be apparent that it is equally applicable to other controls of the type which are actuated by depressing a member against the resilient resistance of a spring to complete a circuit which is automatically broken by the resilient member when the pressure is released. This resiliency is normally supplied by metallic springs of various types although other resilient means are equally available. In the present case, the resiliency is furnished by an element of resilient rubberous material which experience has shown to be at least as durable as a metal spring and—in many circumstances—more economical because of the dual functions it may serve and the ease with which graduated resistance may be obtained for different purposes.

In the usual push-button switch—in which the horn button is a representative example—the button is depressed when the circuit is to be closed and released when it is to be opened. The button then must be reciprocably mounted in the body of the switch, must be resiliently urged outwardly to an extreme position in which the circuit is open and must have sufficient travel to inwardly close the circuit. Accordingly, some means must be provided on the switch body to limit the outward movement of the button in response to the resilient means, yet which will permit the ready assembly or removal of the button as may be required. In many instances, this takes the form of a pin and bayonet slot construction in which the slot is located on the body of the switch and a lug or pin on the button is initially engaged in the open end of the slot, the button is pushed inwardly against the resistance of the spring element until the transverse arm of the slot is reached and then the button is rotated to bring the pin into the locking portion of the slot. The depth of the locking portion of the slot then limits the reciprocatory range of the button and holds it in place against the urging of the spring. In many instances, two separate springs are required in the switch so that it can be thus assembled and disassembled and at the same time sufficient resiliency is imparted to actuate the circuit breaking element. The advantage of the present construction is that

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a single actuating element may be used having different ranges of resiliency to permit the assembly of the switch only through the application of a force much larger than will be encountered in its subsequent operation so that there is no danger of the structure inadvertently becoming disassembled.

A further advantage of the invention is that the spring unit, which may be molded of a rubberous material, is extremely economical to make. Still another advantage is that the rubberous element not only provides necessary resiliency, buts acts as a sound dampening means preventing transmission of noise between the various parts of the device.

A further advantage is that the resilient element, in the form shown, acts as an automatic centering device for the assembly. A further advantage is that an improved electrical contact construction may be employed applying a minimum of parts which are simple to manufacture and easy to assemble.

Other advantages will be apparent from the description of the construction and the operation of the device contained in this specification, set forth in the following claims and shown in the drawings, in which:

Figure 1 is a longitudinal section through the upper end of a steering column and associated steering wheel showing the horn button construction.

Figure 2 is a portion of Figure 1 showing the horn button depressed to close the electrical connection.

Figure 3 is a portion of the showing of Figure 1 in which the horn button is further depressed to permit engagement with or disengagement from the bayonet slot.

Figure 4 is a partial elevation of the inner wall of the horn button mounting showing the bayonet slot, the section indicated by the letters "AA" being substantially that on which Figures 1, 2 and 3 are taken with reference to the slot.

Referring to Figure 1, a steering column construction is shown of the type in which a steering shaft 10 is rotatably supported within a fixed steering column 11 through the medium of a fabric bushing 12 while a gearshift actuating tube 13 is reciprocably and rotatably mounted on the exterior of the column 11 by the interposition of a fabric bushing 14. The operation of the tube 13 is controlled by an operating lever 15 pivoted for rotation on the pin 16 in the bracket 19 fixed to the tube 13 and having a fulcrum end 17 seated in the channel 18 fixed on the steer-

ing column 11. Thus, when the outer end of the operating lever 15 is raised, the bracket 19 and the tube 13 move upwardly against the urging of the spring 20 and when the operating lever 15 is moved in planes normal to the longitudinal axis of the column 11, the bracket 19 and the tube 13 rotate around the column, the fulcrum end 17 sliding in the channel 18. The steering shaft 10 is secured to a metal hub member 21 to which is molded the usual plastic hub 22, spokes 23 and wheel 24. A circumferential slot 25 in the lower face of the hub 22 encloses the upper end of the fixed column 11 and the tube 13 in all of its positions of reciprocation or rotation.

The hub 22 is formed with a central depression 26 in which is seated a dish-shaped metal lining 27 having an upper flange 28 imbedded in the plastic material of the hub and serving as a decorative frame for the horn button 29 and as protection for the thin edge of the hub adjacent the walls of the depression. The horn button 29 is preferably made of a transparent plastic material having a contrasting inner lining 30 and has a depending circumferential flange 31 spaced inwardly from the periphery of the button forming a shoulder 32 and serving to pilot the button 29 axially with the corresponding outer cylindrical section 33 and the inset cylindrical section 34 of the lining 30, while the shoulder 32 and the shoulder 35 on the lining 27 limit the downward movement of the button.

A number of radially extending lugs—one of which is shown at 36—are formed integrally with the flange 31 adjacent its lower edge and are adapted to be engaged in the bayonet slots (shown in Figure 4) to secure the horn button in place. The slot comprises an opening 37 in the shoulder 35 communicating with the entering axial slot 38 in the cylindrical section 34 which leads to the annular slot 39 connecting with the axial locking slot 40 which extends to but not through the shoulder 35. It is apparent that the horn button may be assembled by aligning the lugs 36 axially with the respective openings 37 and axial slots 38, then pushing it inwardly until the lugs 36 are aligned with the annular slots 39, and then rotating it clockwise until the lugs 36 are aligned with the locking slots 40. It is then released and the resilient force of the spring pushes the lugs upwardly in the locking slots 40 holding the horn button in the desired position in which it may be depressed a substantial amount without being freed for rotation.

The resilient element referred to as accomplishing this is indicated generally at 41 and comprises a rubber molding having a cylindrical central hub 42 from which extends a disc 43 terminating in a downwardly directed cylindrical skirt 44 and an upwardly directed tubular element 45 having a diameter much less than that of the disc 43. Both elements 44 and 45 are actually frusta of cones rather than true cylinders when the spring is in an unloaded condition. This conformation—particularly in the case of the skirt 44—serves to centralize the spring element 41 at the juncture between the bottom 46 and the sloping side wall 47 of the lining 27 in which it is seated.

The electrical contact element 48, usually made of brass, has a cylindrical body 49 terminating in an upper flange 50 conforming to the inner diameter of the tubular element 45 and a lower contact flange 51 considerably larger in diameter. The hub 42 of the spring 41 is sufficiently elastic so that it can be deformed to spring over the upper flange 50 and seat itself as shown between the flanges, so that the contact and spring will function as a single unit. The contact 48 has a central hole receiving the horn wire 52 and is counterbored at its lower end to enclose the insulation 53 of the horn cable which is further protected by a short insulating sleeve 54 adjacent the upper end of the steering shaft.

Assuming the horn button assembled as shown, with the lugs 36 seated in the locking slots 40, the electrical circuit is closed by depressing the horn button 29. Due to the conformation of the rubber spring 41, the hub 42 is pushed downwardly until the lower flange 51 of the element 48 makes contact with the upper end of the grounded steering shaft 10 closing the circuit. This movement is countered by the resilient resistance of the rubber spring; but, due to its conformation, this is effected principally by the deflection of the disc 43 and skirt 44 from the position shown in Figure 1 (and in dotted line in Figure 2) to the conformation shown in full in Figure 2. This deformation is accomplished by a relatively small pressure as the resistance of the disc to axial movement is really quite slight. When pressure on the horn button is released, the spring, of course, resumes the shape shown in Figure 1 and the contact is broken. In either event, the lugs 36 do not extend far enough (as will be seen in Figure 2) to leave the locking slots 40 and enter the annular slots 39 so that rotational movement of the horn button will be permitted at the pressure required to close the contact.

However, for assembly or removal of the horn button, a further depression of the button must be permitted so that the lugs 36 will align with the annular slots 39, so that the button may be rotated to bring the lugs 36 from the axial slot 38 to the locking slot 40 or vice versa. This is taken care of by interaction of the tubular element 45 with the hub 42. As continued downward pressure is imposed on the horn button forcing it from the position shown in Figure 2 to that shown in Figure 3, no further substantial deformation of the disc 43 or the skirt 44 occurs since there is no further movement of the contact 48 (which is already firmly seated on the top of the shaft 10) or the hub 42. However, its further movement is countered by deformation of the tubular element 45 which is subjected to the main stress. It is quite clear from the relative proportions that considerably more force is required to distort it than is the case with the disc 43, since the tubular element extends axially while the disc extends transversely to the direction of movement. The extent of distortion is shown by the dotted and full lines in Figure 3 representing the before and after conditions. However, when sufficient force is applied, the lugs 36 are aligned with the slot 39 and may be rotated counterclockwise from the locking slot 40 to alignment with the axial slot 38 and where pressure is then released, the horn button may be removed entirely from the assembly.

The advantage of this construction lies in its simplicity of combining different resiliency characteristics in a single rubber spring. The horn button, activating one phase of the spring's operation, may be operated easily to effect the electrical contact desired. However, while the same resilient means permits such further depression of the button as may be necessary for its as-

sembly or disassembly, the force required for this is so much larger than that required to close the circuit that it will not be exerted by the casual user of the horn. There is thus no chance for the bayonet and slot lock to become disassembled merely through normal use. Furthermore, the spring, despite its several and different resilient functions, is but one unit: an economical rubber molding. This serves not only as the resilient element for the horn button, but is effective to center, automatically, the electrical contact device as well. The electrical contact device used, moreover, is simple to manufacture as a screw machine bottom and is easily assembled with the spring due to the latter's elasticity so that the two function together as a single element. The device is quiet in operation, is not affected by moisture and does not require lubrication. Its durability has been shown by extended tests and its simplicity is such that there is much to recommend it from either the cost, manufacture, or assembly standpoint.

It is realized that certain changes may be made in the specific construction shown herein, but it is the intention to cover by the following claims such of these changes as are within the reasonable scope thereof.

We claim:

1. In a push-button electrical switch construction of the type in which the operating member is resiliently urged into one position of reciprocation and may be depressed therefrom against said urging to another position of reciprocation to effect a change in an electrical circuit but will be automatically returned to said one position when pressure is released, comprising, an operating member, a unitary actuating member formed of resilient rubber-like material having a first portion opposing a relatively slight resistance to the initial travel of said operating member and second portion opposing a substantially greater resistance to continued travel of said operating member thereafter, a mounting, said operating member comprising a horn button reciprocably disposed in said mounting and urged outwardly therefrom by the resiliency of said actuating member, a bayonet and pin connection effective between said horn button and said mounting to limit the outward movement of said button, a fixed contact member on said mounting, a movable contact member insulatedly supported on said actuating member, said movable contact member being adapted to engage said fixed contact member on the flexure of said first portion and said pin and slot being brought into disengaging alignment on further depression of said horn button resiliently opposed by the flexure of said second portion.

2. In a push-button electrical switch construction of the type in which the operating member is resiliently urged into one position of reciprocation and may be depressed therefrom against said urging to another position of reciprocation to effect a change in an electrical circuit but will be automatically returned to said one position when pressure is released, comprising, an operating member, a unitary actuating member formed of resilient rubber-like material having

a first portion opposing a relatively slight resistance to the initial travel of said operating member and second portion opposing a substantially greater resistance to continued travel of said operating member thereafter, a mounting, said operating member comprising a horn button reciprocably received in said mounting, a pin and slot arrangement effective between said mounting and said horn button to restrain the outward movement of said horn button when engaged and subject to being disengaged by depressing said button beyond the point of electrical contact and thereafter rotating said button with respect to said mounting, a fixed contact on said mounting, a movable contact insulatedly supported by said actuating member, said contacts being brought into electrical contact on the initial movement of said horn button and flexure of said first portion, and said pin and slot being brought into disengaging position on further movement of said horn button opposed by flexure of said second portion.

3. In a switch for the steering wheel of an automotive vehicle having a horn button, a steering wheel having a hub including a central depression, a steering shaft traversing said steering wheel hub and secured thereto by a nut threadedly engaging the upper end of said shaft within said depression, comprising, a unitary horn button actuating member formed of a resilient rubber-like material having a central hub positioned directly above said shaft, a diaphragm section arranged substantially transverse to the direction of reciprocal movement of said horn button and having a generally axially extending depending skirt formed around the periphery thereof and extending to the bottom of said depression and enclosing said nut, said skirt being in the form of the frustrum of a cone with its wider end at the bottom of said depression, a sleeve portion extending upwardly from said hub, a metallic contact member having a reduced central portion received in the hub of said actuating member and enlarged flanges at each end thereof, one said flange being seated in said sleeve portion and the other said flange abutting the lower face of the hub of said actuating member and adapted to contact the upper end of said shaft and nut assembly on depression of said horn button, said sleeve portion being in the form of a frustrum of an inverted cone with its wider upper end bearing against said horn button adjacent the center thereof to facilitate tipping of said horn button with respect to said steering wheel hub.

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